

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended): A method of simultaneously transmitting signals over a channel ~~for radio communication~~ between a first device having N plurality of antennas and a second device having M plurality of antennas, the method comprising:

processing a vector \mathbf{s} representing L signals $[s_1 \dots s_L]$ with a transmit matrix \mathbf{A} that is computed to maximize capacity of the channel by multiplying the vector \mathbf{s} with the transmit matrix \mathbf{A} , wherein the transmit matrix \mathbf{A} is equal to $\mathbf{V}\mathbf{D}$, where \mathbf{V} is an eigenvector matrix for $\mathbf{H}^H\mathbf{H}$, \mathbf{H} is the channel response from the first device to the second device, $\mathbf{D} = \text{diag}(d_1, \dots, d_L)$ and $|d_p|^2$ is the transmit power for $p = 1$ to L ~~between the first device and the second device subject to a power constraint that the power emitted by each of the N plurality of antennas is less than or equal to a maximum power, and that weights the L signals $[s_1 \dots s_L]$ for simultaneous transmission along the eigenvectors of the channel between the N plurality of antennas and M plurality of antennas of the second device.~~

2. (currently amended): The method of claim 1, wherein the ~~processing~~ comprises processing the vector \mathbf{s} with the transmit matrix \mathbf{A} that is computed subject to the to a power constraint requiring that the power emitted by one or more of the N plurality of antennas is being different for one or more of the N plurality of antennas.

3. (currently amended): The method of claim 1, wherein the ~~processing~~ comprises ~~processing the vector s with the transmit matrix A that is computed~~ subject to the to a power constraint requiring that the power emitted by being the same for each of the N plurality of antennas is the same.

4. (currently amended): The method of claim 3, wherein the ~~processing~~ comprises ~~processing the vector s with the transmit matrix A that is computed~~ subject to the ~~power constraint for each of the N plurality of antennas being~~ emitted power is equal to a total maximum power emitted by all of the N plurality of antennas combined divided by N.

Claim 5 (canceled)

6. (currently amended): The method of claim 1 ~~claim 5~~, wherein when $N \leq M$, the processing comprises multiplying the vector s with the transmit matrix A , where $D = I \cdot \sqrt{P_{\max}/N}$, and I is the identity matrix, such that the power transmitted by each of the N plurality of antennas is the same and equal to P_{\max}/N .

7. (currently amended): The method of claim 1 ~~claim 5~~, wherein when $N < M$, the ~~processing comprises multiplying the vector s with the transmit matrix A,~~ where $D = \sqrt{d \cdot P_{\max}/N_{Tx}} \cdot I$, such that the power transmitted by antenna i for $i = 1$ to N is $(d \cdot P_{\max}/N) \cdot (VV^H)_{ii}$, and $d_p = d$ for $p = 1$ to L .

8. (currently amended): The method of claim 7, wherein the ~~processing~~ comprises ~~multiplying the vector s with the transmit matrix A,~~ where $d = 1/z$ and $z = \max_i \{(VV^H)_{ii}\}$, such that the maximum power from any of the N plurality of antennas is P_{\max}/N and the total power emitted from the N plurality of antennas combined is between P_{\max}/M and P_{\max} .

9. (currently amended): The method of claim 7, wherein ~~the processing comprises multiplying the vector \mathbf{s} with the transmit matrix \mathbf{A} , where $d = 1$, such that the power emitted by antenna i for $i = 1$ to N is $(P_{\max}/N) \cdot (\mathbf{V}\mathbf{V}^H)_{ii}$, and the total power emitted from the N plurality of antennas combined is P_{\max}/M .~~

10. (previously presented): The method of claim 1, and further comprising: receiving at the M plurality of antennas signals transmitted by the first device; and

processing the signals received at each of the plurality of M antennas with receive weights and combining the resulting signals to recover the L signals.

11. (previously presented): The method of claim 1, wherein each of the L signals is baseband modulated using a multi-carrier modulation process, and wherein the processing comprises multiplying the vector \mathbf{s} with a transmit matrix $\mathbf{A}(k)$ at each of a plurality of sub-carriers k .

12. (currently amended): A radio communication device for simultaneously transmitting signals over a channel, the radio communication device comprising:

- a. N plurality of antennas;
- b. N plurality of radio transmitters each coupled to a corresponding one of the plurality of antennas; and
- c. a baseband signal processor coupled to the N plurality of radio transmitters to process a vector \mathbf{s} representing L signals $[s_1 \dots s_L]$ with a transmit matrix \mathbf{A} that is computed to maximize capacity of the channel by multiplying the vector \mathbf{s} with the transmit matrix \mathbf{A} , wherein the transmit matrix \mathbf{A} is equal to $\mathbf{V}\mathbf{D}$, where \mathbf{V} is an eigenvector matrix for $\mathbf{H}^H\mathbf{H}$, \mathbf{H} is the channel response from the first device to the second device, $\mathbf{D} = \text{diag}(d_1, \dots, d_L)$ and $|d_p|^2$ is the transmit power for $p = 1$ to L between the first device and the second device subject to a power constraint

~~that the power emitted by each of the N plurality of antennas is less than or equal to a maximum power, and that weights the L signals $[s_1 \dots s_L]$ for simultaneous transmission along the eigenvectors of the channel between the N plurality of antennas and a plurality of antennas of the second device.~~

13. (currently amended): The device of claim 12, wherein the ~~baseband signal processor processes the vector s with a transmit matrix A that is computed subject to the~~ to a power constraint requiring that the power emitted by one or more of the N plurality of antennas is being different for one or more of the N plurality of antennas.

14. (currently amended): The device of claim 12, wherein the ~~baseband signal processor processes the vector s with a transmit matrix A that is computed subject to the~~ to a power constraint requiring that the power emitted by being the same for each of the N plurality of antennas is the same.

15. (currently amended): The device of claim 14, wherein the ~~baseband signal processor processes the vector s with a transmit matrix A that is computed subject to the power constraint for each of the N plurality of antennas being~~ power is equal to a total maximum power emitted by all of the N plurality of antennas combined divided by N.

Claim 16 (canceled)

17. (currently amended): The device of claim 12 ~~claim 16~~, wherein when $N \leq M$, the ~~baseband signal processor multiplies the vector s with the transmit matrix A that is computed where $D = I \cdot \sqrt{P_{\max}/N}$, and I is the identity matrix, such that~~

the power transmitted by each of the N plurality of antennas is the same and equal to P_{\max}/N .

18. (currently amended): The device of claim 12 ~~claim 16~~, wherein when $N < M$, the baseband signal processor multiplies the vector \mathbf{s} with the transmit matrix \mathbf{A} that is computed where $\mathbf{D} = \text{sqrt}(d \cdot P_{\max}/N_{\text{Tx}}) \cdot \mathbf{I}$ such that the power emitted by antenna i for $i = 1$ to N is $(d \cdot P_{\max}/N) \cdot (\mathbf{V}\mathbf{V}^H)_{ii}$, and $d_p = d$ for $p = 1$ to L .

19. (currently amended): The device of claim 18, wherein ~~the baseband signal processor multiplies the vector \mathbf{s} with the transmit matrix \mathbf{A} that is computed~~ where $d = 1/z$ and $z = \max_i \{(\mathbf{V}\mathbf{V}^H)_{ii}\}$ such that the maximum power from any antenna of the N plurality of antennas is P_{\max}/N and the total power emitted from the N plurality of antennas combined is between P_{\max}/M and P_{\max} .

20. (currently amended): The device of claim 18, wherein ~~the baseband signal processor multiplies the vector \mathbf{s} with the transmit matrix \mathbf{A} that is computed~~ where $d = 1$, such that the power emitted by antenna i for $i = 1$ to N is $(P_{\max}/N) \cdot (\mathbf{V}\mathbf{V}^H)_{ii}$, and the total power emitted from the N plurality of antennas combined is P_{\max}/M .

21. (original): The device of claim 12, wherein each of the L signals is baseband modulated using a multi-carrier modulation process, and the baseband signal processor multiplies the vector \mathbf{s} with a transmit matrix $\mathbf{A}(k)$ at each of a plurality of sub-carriers k .

22. (currently amended): A radio communication system for simultaneously transmitting signals over a channel, the radio communication system comprising:

- a. a first device comprising:
 - i. N plurality of antennas;
 - ii. N plurality of radio transmitters each coupled to a corresponding one of the plurality of antennas; and
 - iii. a baseband signal processor coupled to the N plurality of radio transmitters to process a vector \mathbf{s} representing L signals $[s_1 \dots s_L]$ with a transmit matrix \mathbf{A} that is computed to maximize capacity of the channel by multiplying the vector \mathbf{s} with the transmit matrix \mathbf{A} , wherein the transmit matrix \mathbf{A} is equal to $\mathbf{V}\mathbf{D}$, where \mathbf{V} is an eigenvector matrix for $\mathbf{H}^H\mathbf{H}$, \mathbf{H} is the channel response from the first device to the second device, $\mathbf{D} = \text{diag}(d_1, \dots, d_L)$ and $|d_p|^2$ is the transmit power for $p = 1$ to L between the first device and the second device subject to a power constraint that the power emitted by each of the N plurality of antennas is less than or equal to a maximum power, and that weights the L signals $[s_1 \dots s_L]$ for simultaneous transmission along the eigenvectors of the channel between the N plurality of antennas and a plurality of antennas of a second device;
- b. the second device comprising:
 - i. M plurality of antennas;
 - ii. M plurality of radio receivers each coupled to a corresponding one of the plurality of antennas; and
 - iii. a baseband signal processor coupled to the N plurality of radio receivers to process signals output by the plurality of radio receivers with receive weights and combining the resulting signals to recover the L signals $[s_1 \dots s_L]$.

23. (currently amended): The system of claim 22, wherein the ~~baseband signal processor of the first device processes the vector \mathbf{s} with the transmit matrix \mathbf{A} that is computed subject to the~~ to a power constraint requiring that the power emitted by one or more of the N plurality of antennas is being different for one or more of the N antennas.

24. (currently amended): The system of claim 23, wherein the ~~baseband signal processor of the first device processes the vector s with the transmit matrix A~~ that is computed subject ~~to the~~ to a power constraint requiring that the power emitted by being the same for each of the N plurality of antennas is the same.

25. (currently amended): The system of claim 24, wherein the ~~baseband signal processor of the first device processes the vector s with the transmit matrix A~~ that is computed ~~subject to the power constraint for each of the N antennas being~~ emitted power is equal to a total maximum power emitted by all of the N antennas combined divided by N .

Claim 26 (canceled)